

What is claimed is:

1. An organosilane-based composition for producing a barrier layer for gases, comprising
 - 5 (i) at least one organoalkoxysilane whose organofunctionality displays at least one unsaturated hydrocarbon group,
 - (ii) at least one aminoalkylalkoxysilane,
 - (iii) at least one polyol,
 - (iv) optionally, another alkoxysilane or alkoxysiloxane, and
 - 10 (v) optionally, at least one nano- or microscale semimetal oxide or metal oxide; semimetal oxide hydroxide or metal oxide hydroxide, or semimetal hydroxide or metal hydroxide, and/or
 - (vi) at least one cocondensate composed of the components (i), (ii), (iii), and, optionally, (iv), and also, optionally, (v), and/or
 - 15 (vii) reaction products produced under hydrolysis conditions from the components (i), (ii), (iii), and, optionally, (iv), and also, optionally, (v)
 - (viii) and organic solvent, with the proviso that there is a molar ratio (i) : (ii) : (iii) where (i) = 1 and (ii) = from 0.5 to 1.5, and (iii) = from 0.3 to 1.1.
- 20 2. The composition as claimed in claim 1, comprising a component (i) selected from the series vinyltrimethoxysilane, vinyltriethoxysilane, 3-methacryloxypropyltrimethoxysilane, 3-methacryloxypropyltriethoxysilane, 3-methacryloxypropylmethyldimethoxysilane, vinylmethyldimethoxysilane, vinylmethyldiethoxysilane, 3-methacryloxypropylmethyldiethoxysilane, 3-acryloxypropyltri-
25 methoxysilane, 3-acryloxypropyltriethoxysilane, 3-acryloxypropylmethyldiethoxysilane, 3-acryloxypropylmethyldiethoxysilane.
3. The composition as claimed in claim 1 or 2, which comprises a component (ii) selected from the series 3-aminopropyltrimethoxysilane, 3-aminopropyltriethoxysilane, N-phenyl-3-aminopropyltrimethoxysilane, N-phenyl-3-amino-
30 propyltriethoxysilane, N-butyl-3-aminopropyltrimethoxysilane, N-butyl-3-amino-

propyltriethoxysilane, N-methyl-3-aminopropyltrimethoxysilane, N-methyl-3-aminopropyltriethoxysilane, N-(2-aminoethyl)-3-aminopropyltrimethoxysilane, N-(2-aminoethyl)-3-aminopropyltriethoxysilane, N,N-di(2-aminoethyl)-3-aminopropyltrimethoxysilane, N-[N'-(2-aminoethyl)-2-aminoethyl]-3-aminopropyltrimethoxysilane, N,N-di(2-aminoethyl)-3-aminopropyltriethoxysilane, N-[N'-(2-aminoethyl)-2-aminoethyl]-3-aminopropyltriethoxysilane, 3-aminopropylmethyldimethoxysilane, 3-aminopropylmethyldiethoxysilane, N-butyl-3-aminopropylmethyldimethoxysilane, N-butyl-3-aminopropylmethyldiethoxysilane, N-(2-aminoethyl)-3-aminopropylmethyldimethoxysilane, N-(2-aminoethyl)-3-aminopropylmethyldiethoxysilane, N,N-di(2-aminoethyl)-3-aminopropylmethyldimethoxysilane, N-[N'-(2-aminoethyl)-2-aminoethyl]-3-aminopropylmethyldiethoxysilane, N,N-di(2-aminoethyl)-3-aminopropylmethyldimethoxysilane, N-[N'-(2-aminoethyl)-2-aminoethyl]-3-aminopropylmethyldiethoxysilane.

4. The composition as claimed in any of claims 1 to 3, wherein component (iii) is an aliphatic or aromatic polyol.

5. The composition as claimed in any of claims 1 to 4, wherein component (iii) comprises glucose, xylitol, mannitol, sorbitol, resorcinol, pyrogallol, hydroquinone, salicylic acid, or glycerol.

6. The composition as claimed in any of claims 1 to 5, which comprises a component (iv) selected from the series tetraethoxysilane, oligomeric tetraalkoxysilane, propyltrimethoxysilane, propyltriethoxysilane, octyltrimethoxysilane, octyltriethoxysilane, alcoholic and/or aqueous compositions of oligomeric cocondensates composed of aminoalkylalkoxysilanes and of fluoroalkylalkoxysilanes, and also oligomeric condensates or cocondensates composed of alkylalkoxysilanes and/or of vinylalkoxysilanes.

7. The composition as claimed in any of claims 1 to 6, which comprises a component (v) selected from the series silica (precipitated or fumed), silicates,

aluminum oxides, aluminum oxide hydroxides, aluminum hydroxide.

8. The composition as claimed in any of claims 1 to 7, wherein the organic solvent is a straight-chain or branched, aliphatic or cycloaliphatic or araliphatic or aromatic alcohol.

9. The composition as claimed in any of claims 1 to 8, which comprises photoinitiator.

10. The composition as claimed in any of claims 1 to 9, which comprises from 10 to 60% by weight of solids.

11. A process for preparing an organosilane-based composition for producing a barrier layer for gases as claimed in any of claims 1 to 10, which comprises

a) mixing together components (i), (ii), (iii), optionally (iv), optionally solvents and water, and permitting the mixture to react at room temperature

or

b) forming an initial charge from components (i), (ii), and, optionally, (iv), heating the mixture, adding component (iii), optionally dissolved in a solvent, and adding water, and permitting the mixture to react at reflux

or

c) forming an initial charge from components (i), (ii), optionally (iv), optionally solvents, and, optionally, component (v), with thorough mixing, heating the mixture, adding component (iii), optionally dissolved in a solvent, and adding water, and permitting the mixture to react at reflux

or

d) dispersing fine-particle silica in vinylsilane, adding the other components, and reacting the mixture at room temperature or at reflux

where there is a molar ratio (i) : (ii) : (iii) where (i) = 1 and (ii) = from 0.5 to 1.5 and (iii) = from 0.3 to 1.1.

12. The process as claimed in claim 11,
wherein
use is made of from 0.5 to 1.8 mol of water per mole of silicon of components
5 (i), (ii), and (iv).
13. The process as claimed in claim 11 or 12,
wherein
the amount used of component (v) is from 0.01 to 40% by weight, based on the
10 entirety of components (i) to (iv).
14. The process as claimed in any of claims 11 to 13,
wherein
the reaction is carried out at a temperature in the range from 10 to 90°C and for
15 a period of from 1 to 36 hours.
15. The use of a composition as claimed in any of claims 1 to 10 or of a composition
obtainable as claimed in any of claims 11 to 14 for producing a radiation-cured
barrier layer for gases on a packaging material composed of plastic, paper,
20 cardboard, or paperboard.
16. The use of a composition as claimed in any of claims 1 to 10 or a composition
obtainable as claimed in any of claims 11 to 15 for producing a radiation-cured
barrier layer for gases, where at least one further coating capable of curing by a
25 thermal, free-radical, or radiation method is applied as outer layer to the barrier
layer.
17. The use as claimed in claim 16, wherein to produce the outer layer a coating
composition is applied which comprises a binder curable by UV radiation or
30 electron beams and comprises inorganic lamellar particles, where either the
outer layer material is applied to the cured first barrier layer and then is cured or

the first barrier layer and the outer layer are applied wet-on-wet and cured together.

- 5 18. The use as claimed in claim 16 or 17, wherein the binder of the coating composition for the outer layer has been selected from the group consisting of acrylates, urethane-derived acrylates, epoxy-derived acrylates, cycloaliphatic epoxides, and polyepoxides.
- 10 19. The use as claimed in any of claims 16 to 18, wherein the lamellar particles have been selected from the group of the phyllosilicates or of the lamellar metal pigments.
- 15 20. The use as claimed in any of claims 16 to 19, where the further coating applied comprises a lacquer which comprises not only a photoinitiator but also, as further components, at least one reaction product derived from fine pulverulent silicate, organofunctional silane, and water.
- 20 21. A packaging material composed of plastic, paper, cardboard, or paperboard, which has been coated with a barrier layer composed of a cured composition as claimed in any of claims 1 to 10.
- 25 22. The packaging material as claimed in claim 21, which has been coated with a further cured outer layer which has been arranged on the barrier layer and has been produced by applying and curing a coating composition which comprises a binder curable by UV radiation or electron beams and comprises inorganic lamellar particles.
- 30 23. The packaging material as claimed in claim 21 or 22, which is sheet-like and takes the form of foils, sheets, or webs.
24. The packaging material as claimed in claim 21 or 22, which takes the form of

three-dimensional hollow articles.